NEW AUSTRALIAN SPECIES OF *TRIGLOCHIN* L. (JUNCAGINACEAE) FORMERLY INCLUDED IN *T. PROCERUM* R. Br.

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ABSTRACT

Aston, H.I. New Australian species of *Triglochin* L. (Juncaginaceae) formerly included in *T. procerum* R. Br. **Muelleria 8(1): 85–97 (1993).** — *Triglochin alcockiae*, *Triglochin microtuberosum*, *Triglochin multifructum* and *Triglochin rheophilum* are described as new species from eastern Australia. Notes on diagnostic features, geographical distribution and habitat preferences accompany each description. Maps are included.

INTRODUCTION

This paper is a precursor to a full revision of the tuberous-rooted species of *Triglochin* L. found within Australia. It is published now in order to make the new names available in time for the forthcoming 'Flora of Victoria'.

The descriptions are presented in the same format to be used for other species in the full revision. This will allow direct comparison between all species. The revision will include further discussion of the details given here.

Triglochin L. has been treated by different authors as either feminine or neuter but Rauschert (1974) argued that it should correctly be accepted as neuter. Dr L.A.S. Johnson (*in litt.*) has assured me that Rauschert's argument is sound. The spelling *Triglochin procera* is therefore correctly *Triglochin procerum* and other epithet endings follow suit.

TAXONOMY

Triglochin alcockiae H.I. Aston *sp. nov.*

Triglochin procerum 'S-w Vic', Aston *in litt.*

T. procero R.Br. tuberibus parvioribus, 1–3plo tantum longioribus quam latioribus, fructibus paucioribus typice latioribus quam longioribus, marginibus ventralibus carpellorum fructicantium affixis non nisi secus infernum 20%-39% longitudinem carpelli distinguitur.

TYPUS: Victoria, *c.* 38 km (straight line) south-west of Horsham. Swamp at north end of Toolondo Reservoir. 36° 59′S, 141° 56′E. Common in still, tannin-stained to clear fresh water few-30 cm deep. 9 Nov. 1988, *H.I. Aston 2705* (HOLOTYPUS: MEL 705957; ISOTYPI: AD, BRI, CANB, CBG, HO, K, MEL 705956 & 705962 & 705963 & spirit material, NSW, PERTH).

Rhizomes vertical, 1.7–7 cm long × 7–10 mm diam., bearing short fine soft fibres to 2 cm long, rarely to 11 cm. *Tubers* ellipsoid, obloid or globular to oblanceolate or obovate, 8–20(-28) mm long × 5–12 mm diam. (length 1.0–3.0 times the diam.), terminating roots 5–35 mm long; each root 0.3–2.3 times as long as its tuber. *Leaves* (6-)26–91 cm long × (1-) 2–8 mm wide, dorsiventral, medium-green and glossy above, paler beneath, bending below the water surface, the emerged portions floating and maintaining contact with the water along their whole length (or sometimes held semi-erect by surrounding herbage), ± linear, flat to slightly plano-convex in T.S., shortly tapered, obtuse, moderately thickened and spongy toward the base, sheathed over the lower 16%–38% of the leaf length. *T.S. leaf about 3 cm below the sheath summit*: narrowly plano- to concavo-convex, width 3.8–4.3 times the thickness; each side of sheath 2.1–2.6 mm wide, equal *c.* 34%–45% of the leaf width. *Stems* in fruit 28–81 cm long (including the infructescence)

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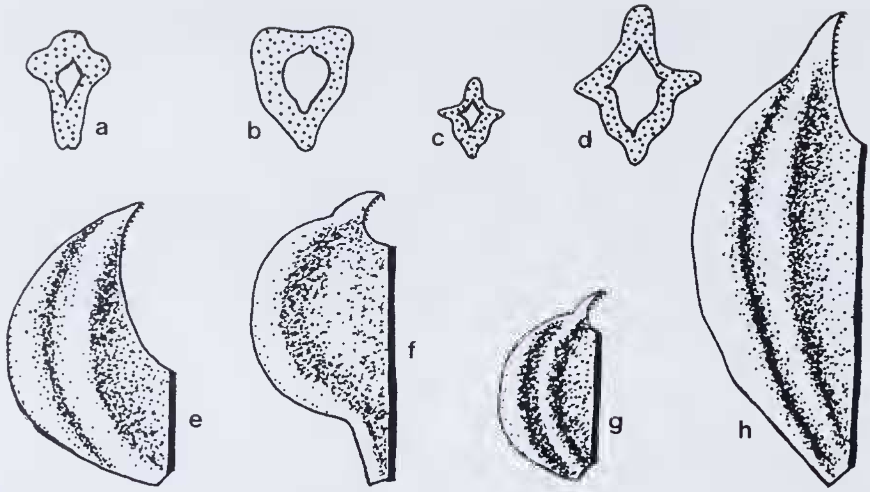

Fig. 1. Mature fruiting carpels of *Triglochin* spp. a–d — outline in T.S., dorsal surface at top. e–h — lateral view, dorsal surface to left, ventral attachment shown by thickened line at right. — a & e, *T. alcockiae*, from *Aston 2722* (MEL). b & f, *T. microtuberosum*, from *Aston 2683* (MEL). c & g, *T. multifructum*, from *Aston 2797* (MEL). d & h, *T. rheophilum*, from *Clarke 1934* (MEL). All × 5.

× 1.3–5.9 mm diameter. *Rachis* 1.0–2.6 mm diam. at base, gradually tapered upwards; rachis and pedicels pale cream-green or the rachis (occasionally also the pedicels) pale to deep maroon-red. *Infructescence* (0.6-)2–13.5 cm long (= 5%–28% of the total stem length) × 11–19 mm diameter. *Pedicels* often upcurved, 1.2–3.5 mm long. *Fruits* loosely touching to shortly spaced, (1-)8–67 per infructescence, 3–8 per 1 cm of rachis length, globular to depressed globular in outline, usually broader than long, 5.6–8.7 mm long × 6.6–9.9 mm diameter. *Carpels* (5 or) 6, in fruit straight and erect or the upper portions partly spiralled around each other and then giving a semi-twisted appearance to the fruit, all maturing or 1 or 2 (occasionally to 5) aborted, 5.6–8.5 mm long × 1.3–3.0 mm wide × 2.3–4.1 mm deep; ventral edges attached only over the lower portions; attachment length = 20%–39% of the carpel length; lateral faces ± flat to slightly concave or convex, mostly not adpressed; dorsal ridge broad-rounded, 10%–22% of carpel depth; shoulder ridges rounded, 17%–26% of carpel width. (Fig. 1 a & e)

Selected Specimens Examined (total examined = 70)

South Australia — Bangham area, 23 Oct. 1988, *Alcock s.n.* (MEL); 1 km N of Pages Flat Road, Southern Lofty Ranges, 10 Oct. 1977, *Bell 327* (AD); Section 66, Hundred of Townsend, 24 Oct. 1981, *Conrick 683* (AD); Comaum, *c.* 40 km SSE of Naracoorte, 21 Oct. 1962, *Hunt 1255* (AD); Kelly Hill, *c.* 13 km ENE of Cape du Couedic, Kangaroo Island, 7 Nov. 1958, *Wilson 787* (AD; also AK, BISH, UC *n.v.*).

Victoria — Mundarra, *c.* 11 km WSW of Edenhope, 11 Nov. 1988, *Aston 2720* (AD, MEL, NSW); Swamp beside the Glenelg River, 2.4 km E of Dergholm, 12 Nov. 1988, *Aston 2724* (AD, MEL, NSW); Coleraine racetrack, *c.* 4 km E of centre of Coleraine town, 12 Nov. 1988, *Aston 2726* (MEL); 1.75 km W of Bay of Martyrs carpark, *c.* 2 km W of Peterborough, 2 Jan. 1992, *Carr 11680* (AD, BRI, CANB, HO, K, MEL, NSW).

Tasmania — Near Longford, 19 Nov. 1951, *Barber s.n.* (HO); Melaleuca Creek, Bathurst Harbour, 23 Jan. 1979, *Chandler s.n.* (MEL); 1.5 km W of Cape Naturaliste, 14 Oct. 1983, *Moscal 3493* (HO, MEL); Hardwickes Hill, 24 Nov. 1983, *Moscal 4438* (HO, also AD *n.v.*); Wanderer River, 9 Mar. 1985, *Moscal 10131* (HO).

Distribution (Fig. 2)

Occurs in South Australia on Kangaroo Island and in the Southern Lofty and south-eastern regions, extending into south-western Victoria south-west of

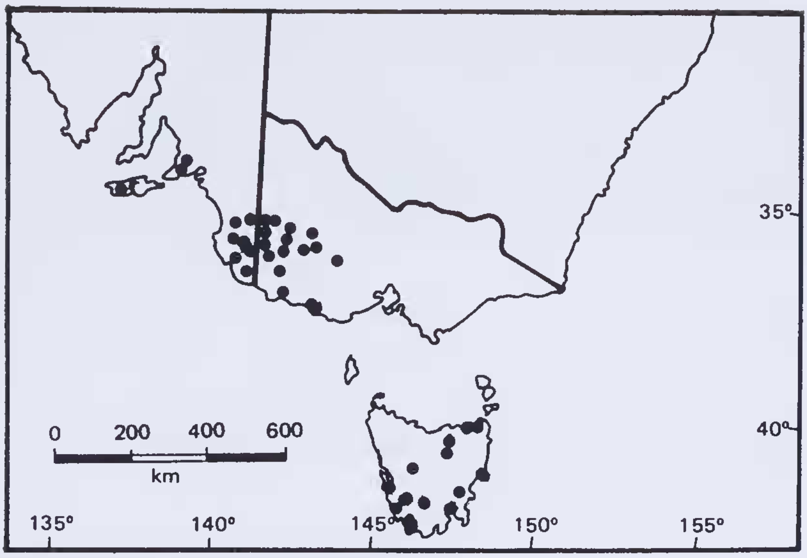

Fig. 2. Distribution map of *Triglochin alcockiae*.

approximately the Little Desert, Stawell and Port Campbell. Also widespread in central, eastern and southern Tasmania.

Habitat

Usually fresh, still, clear water to 30(–50) cm deep in ephemeral swamps, pools and swampy flats; occasionally edging small streams or in tannin-stained or stagnant water. Occasionally in brackish water of coastal swamp (*Carr 1168*) or tidal stream (*Moscal 10131*). Substrate fine, often humic, sand, silt, sandy-loam or sandy-clay, generally over fine sticky grey or black clay; a stony alluvial stream bank also recorded. Swamps typically in *Eucalyptus camaldulensis* (River Red Gum) or *E. baxteri* (Brown Stringybark) open forest, heathland, or open grassy pastureland. *Triglochin alcockiae* often co-exists within dense assemblages of sedges and aquatic or semi-aquatic herbs, e.g. *Baumea juncea*, *B. tetragona*, *Carex* sp., *Chorizandra cymbaria*, *Schoenus tesquorum*, *Scirpus fluitans*, *Craspedia* sp., *Hypolaena longissima*, *Isoetes* sp., *Leptocarpus brownii*, *Liliaeopsis* sp., *Milligania johnstonii*, *Myriophyllum muelleri*, *M. salsugineum*, *Neopaxia australasica*, *Potamogeton tricarinatus*, *Selliera radicans*, *Stellaria* sp., *Swainsona procumbens*, *Ranunculus robertsonii*, *Triglochin striatum*, *T. turriferum*, *Villarsia reniformis*.

Commonly occurs from virtually sea level to 200 m altitude, but recorded up to *c.* 300 m on the mainland (Grampians and Southern Lofty areas) and up to *c.* 750 m in Tasmania.

Flowers from September to December on the mainland; September to March in Tasmania. Fruits from (September-) October to December (–January) in Victoria and South Australia; October to March in Tasmania.

Diagnosis and Etymology

Triglochin alcockiae is a comparatively small and slender species with distinctive fruits and partially distinctive tubers. Mature fruits are comparatively few, 1–67 per infructescence, to 8.7 mm long and 9.9 mm diam., usually somewhat broader than long, globular to depressed-globular in outline with rounded dorsal ridges. Fruiting carpels are ventrally attached only over the lower 20%–39% of the carpel length. The free upper portion of the carpels may be partially spiralled around each other. Of the (5 or) 6 carpels in the developing fruit all may mature or frequently 1 or 2, sometimes more, may abort.

Tubers are distinctively smaller and plumper than those of the sympatric *T. procerum* but can resemble those of some of the allopatric species of *Triglochin.*

The specific epithet *alcockiae* commemorates Mrs Kath Alcock of Naracoorte (formerly of Comaum), South Australia. Mrs Alcock has displayed a deep interest in the plants of her area over many years and was the first to alert me to the existence of this species.

Field Observations

Triglochin alcockiae has been observed (*Aston 2724*) in the field growing intermingled with *Triglochin procerum* (*Aston 2725*). Plants of each species exhibited distinctive differences in fruits, tubers and racemes, with no gradations.

Triglochin microtuberosum H.I. Aston *sp.nov.*

Triglochin procerum agg., form B, Robb & Ladiges (1981).

Triglochin procerum 'B', Aston *in litt.*

Triglochin procero R. Br. tuberibus parvis prope rhizomate fasciculatis, fructibus pyriformibus plus minusve, et carpellis fructicantibus sine cristis dorsalibus distinguitur.

Typus: Victoria, East Gippsland, 'Redbanks' farm, *c.* 2 km south-east of Genoa, 37°28′S, 149°36′E. Abundant in stagnant waterhole of an otherwise-dry creek in cleared grazing country. Water highly eutrophic, muddy, with much farm run-off and cow-dung from cattle which have eaten the *Triglochin* and trampled the substrate. 23 Feb. 1988, *H.I. Aston 2683* (Holotypus: MEL 705958; Isotypi: AD, BRI, CANB, MEL 705961 & spirit material, NSW).

Rhizomes horizontal, to 7 cm long × 6–12 mm diam., bearing short coarse bristly fibres to 12 mm long. *Tubers* near-globular to obloid or rarely obovoid, 4.5–13(–17) mm long × 3–6 mm diam. (length 1.1–1.9(–5) times the diam.), terminating roots 1–7(–14) mm long; each root 0.2–2 times as long as its tuber (see under Notes below re abnormal tubers). *Leaves* 30–137 cm long × 3–12 mm wide, dorsiventral, deep green above, paler green beneath, emergent, erect or with the extremities outcurved, sometimes the emerged portion fully floating or recurved with only the extremity floating, tapered and flattened distally, acute, very thickened and spongy toward the base, sheathed over the lower 27%–49% of the leaf length. *T.S. leaf about 3 cm below the sheath summit*: broadly plano- to concavo-convex and ± semi-cylindrical, width 1.6–2.4 times the thickness; each side of sheath 3.4–9.0 mm wide, equal *c.* 50%–84% of the leaf width, the two sheaths usually touching to overlapping; blade and sheaths together ± rounded in outline. *Stems* in fruit 54–124 cm long (including the infructescence) × 2.5–12.6 mm diameter. *Rachis* 1.5–4.0 mm diam. at base, gradually tapered upwards; rachis and pedicels green. *Infructescence* 7–21 cm long (= 10%–20% of the total stem length) × 15–24 mm diameter. *Pedicels* 0.5–3.0 mm long. *Fruits* touching, 44–137 per infructescence, 7–9 per 1 cm of rachis length, very widely obovoid in outline but with the base contracted into a distinctive stalk, 7.0–9.6 mm long × 5.5–8.2 mm diameter. *Carpels* (5 or) 6, in fruit straight and erect, never twisted, normally all maturing, 7.0–9.6 mm long × 2.25–3.35 mm wide × 2.6–3.75 mm deep; ventral edges attached along their whole length (excluding the beak sinus); attachment length = 58%–70% of carpel length; lateral faces ± flat, adpressed; dorsal ridge absent, the dorsal face usually shallowly concave longitudinally or sometimes shallowly convex; shoulders rounded not ridged; carpel ± triangular in cross section. (Fig. 1 b & f)

Selected Specimens Examined (total examined = 32)

Queensland — Between Tamborine Village and Canungra, 27 Aug. 1961, *Blake 21593* (BRI, CBG, DNA, NSW); Serpentine Creek and environs, *c.* 11 km NE of Brisbane, Nov. 1972, *Durrington 531* (BRI).

New South Wales — About 2 km N of Carmichaels Creek, between Clarence Town and Morpeth, 28 Nov. 1989, *Aston 2791* (MEL, NSW); Creek flowing into SW side of Betunga/Penooka swamplands, *c.* 9 km SE of Bega, 13 Feb. 1990, *Aston 2813* (BRI, CANB, MEL, NSW); 200 m S of the Tuross River where crossed by the Princes Highway, 14 Feb. 1990, *Aston 2814* (BRI, CBG, MEL, NSW); Tooloom Falls, 3 miles from Urbenville, North Coast region, 4 Dec. 1970, *Telford 2699* (CBG).

Victoria — Cox's Bridge over South Gippsland Highway, *c.* 0.5 km S of Sale, 6 Apr. 1987, *Aston 2619* (HO, MEL, NSW); Bunga Creek, at Princes Highway, *c.* 5 km NE of Lakes Entrance, 7 Apr. 1987, *Aston 2639* (MEL, NSW); 'Carinya', *c.* 1 or 2 km W of Swan Reach, 9 Apr. 1987, *Aston 2650* (BRI, CANB, HO, MEL, NSW); E side of Corringle Beach Road, 0.5 km S of the Princes Highway at Newmerella, 22 Jan. 1992, *Aston 2841* (BRI, CANB, MEL).

Distribution (Fig. 3)

Common in Central and South Coast regions of New South Wales and in coastal eastern Victoria, extending from the Myall Lakes south and west to Sale. Also three disjunct records from south-east Queensland and north-east New South Wales (vicinities of Brisbane, Canungra and Urbenville).

Habitat

Fresh, usually still, sometimes gently flowing water to 50(–120) cm deep in seasonal to permanent swamps, farm dams, and small swampy creeks; stagnant water often highly eutrophic and humic with farm run-off, rotting vegetation and cattle-dung; flowing water clear. Rhizomes and roots embedded in fine black

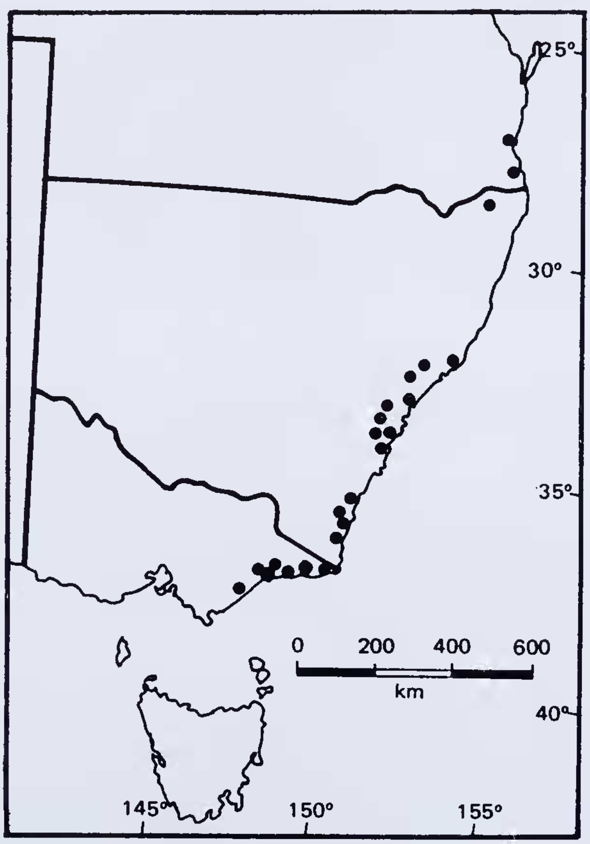

Fig. 3. Distribution map of *Triglochin microtuberosum*.

humic silt, loamy-peat, grey loam, loamy to pure or gravelly sand, gravelly-mud or (one record) clay; substrate often trampled by cattle which graze the *Triglochin*. Sites typically in cleared grassy pastures; recorded also from natural *Casuarina/Gahnia* swampland and from cleared swampland previously occupied by *Melaleuca ericifolia*. Associated species recorded are *Eleocharis sphacelata*, *Juncus* sp., *J. usitatus*, *Cyperus* sp., *C. gunnii*, *Myriophyllum* sp., *Triglochin procerum*, *Cotula coronopifolia*, *Ludwigia peploides*, *Potamogeton ochreatus*, and *Utricularia* sp.

A lowland species, mostly from *c.* 3–100 m altitude. Highest record *c.* 400 m (*Telford 2699*).

Flowers and fruits recorded all months from August to May, particularly November to April.

NOTES

When dry, the distinctive stalk of approximately the basal quarter or third of the fruit is narrowed through shrinking and may superficially be mistaken for an extension of the pedicel. The remainder of the fruit then appears depressed-globular.

Some collections (*Aston 2791, 2792*) from Morpeth, New South Wales, had unusual elongated spindle-shaped tubers to 30 mm long × 3 mm diam. on roots to 28 mm long. Other tubers and roots, and the proportions of these, agreed with the descriptions and measurements given in the main description above.

DIAGNOSIS AND ETYMOLOGY

Triglochin microtuberosum has distinctive small numerous tubers terminating very short roots so that the tubers are clustered closely against the rhizome. The more or less pear-shaped fruit with squat summit, stalk-like base and absence of dorsal ridges is also distinctive, the (5 or)6 carpels being ventrally attached over most of their length and more or less triangular in cross-section.

A helpful characteristic, although partly shared with the eastern variant of *T. procerum*, is the more or less cylindrical shape of the lower leaf as seen in cross-section below the sheath summit. Here the leaf blade is thickly spongy, i.e. the blade is deep in comparison with its width, and the sheaths are curved and usually touching to overlapping.

The epithet *microtuberosum* refers to the small clustered tubers which allow even vegetative recognition of this species.

Triglochin multifructum H.I. Aston *sp. nov.*

Triglochin procerum agg., form A, Robb & Ladiges (1981).
Triglochin procerum 'A', Aston *in litt.*

Triglochin procero R.Br. fructibus parvioribus, numerosis plus, farctis (14–27 per 1 cm rhachidis), globosis in circumferentia sed porcatis prominentibus maturitate distinguitur.

TYPUS: New South Wales, *c.* 11 km ± north-east of Barham, 35°34′01″S, 144°12′06″E. In 25 cm of slow-flowing water in small irrigation channel through open farmland. Common. <80 m altitude. 19 Apr. 1987, *H.I. Aston 2656* (HOLOTYPUS: MEL 705960; ISOTYPI: AD, BRI, CANB, MEL 705959 & spirit material, NSW).

Rhizomes horizontal to upcurved, to 11.5 cm long × 14–18 mm diam., bearing long fine soft fibres 1–6 cm long. *Tubers* narrow-ellipsoid or narrow-obovoid to ellipsoid or obovoid, rarely broad-obovoid, 13–40 mm long × 4–14 mm diam. (length 1.3–5.2 times the diam.), terminating roots (8–)20–100 mm long; each root 1–4(–5.7) times as long as its tuber. *Leaves* 43–133 cm long × 3.5–17(–34) mm wide, dorsiventral, deep green and glossy above, paler yellowish-green below, floating or sometimes with an emerged curve or with the extremities of younger shorter leaves emergent and erect, shortly tapered, obtuse-acute, thickened and spongy toward the base, sheathed over the lower 14%–20% of the leaf length. *T.S.*

leaf about 3 cm below the sheath summit: narrowly plano- to concavo-convex, width 4.3–6.5 times the thickness; each side of sheath 2–6 mm wide, equal *c.* 20%–40% of the leaf width. *Stems* in fruit 41–112(–175) cm long (including the infructescence) × 3.5–15 mm diameter. *Rachis* 2.3–5.5(–9) mm diam. at base, gradually tapered upwards; rachis and pedicels usually pale to deep maroon-cyclamen, or sometimes the rachis pale cream-green. *Infructescence* 12–36.5(–110) cm long (= 17%–46%(–63%) of the total stem length) × 10–19 mm diameter. *Pedicels* 1.1–4 mm long. *Fruits* tightly touching, 229-*c.* 1000 per infructescence, 14–27 per 1 cm of rachis length, globular in outline, 3–5 mm long × 3–5 mm diameter. *Carpels* 6(–8), straight and erect in fruit, normally all maturing, rarely 1 aborted, 3–5 mm long × 0.9–1.5 mm wide × 1.1–2.25 mm deep; ventral edges attached along their whole length (excluding the beak sinus); attachment length = 57%–75% of carpel length; lateral faces ± flat, adpressed; dorsal ridge prominent, narrow-rounded (32%–42% of carpel depth); shoulder ridges inconspicuous before carpels separate but then seen in T.S. to be 15%–28% of carpel width. See also variant description under Notes. (Fig. 1 c & g)

Selected Specimens Examined (total examined = 115)

Northern Territory — Bing Bong Station, 8 Jan. 1971, *Dunlop 2254* (DNA).

Queensland — 4.5 km E of Byfield, 4 Aug. 1985, *Anderson 4022* (BRI); Cashmere, date ?, *Armit 73* (MEL); 0.5 km N of Norman River at Normanton, 20 May 1982, *Aston 2276* (AD, BRI, MEL); 18 km N of Taroom, 7 Sep. 1983, *Aston 2497* (BRI, MEL); Kroombit Tableland, 60 km SW of Gladstone, 4 Jun. 1977, *Crisp 2784* (CBG); Coongarra Falls, Burnett District, 29 Dec. 1989, *Forster 6153* (BRI); Beerburrum Creek, *c.* 55 km N of Brisbane, 13 Nov. 1956, *Eichler 13148* (AD); 10 miles S of Mt Molloy, 1 Jul. 1962, *Hoogland 8509* (BRI, CANB); 24 km N of Mareeba, 1 May 1986, *Jacobs 4849 & Sainty* (NSW); Near Georgetown, May 1976, *Scarth-Johnson 57A* (BRI); Tambo, Barcoo River, 1874, *Dr Wuth s.n.* (MEL).

New South Wales — 7 km N of Tooleybuc, 16 Dec. 1988, *Aston 2733* (MEL, NSW, PERTH); Poisoned Waterholes Creek, 9 km SSE of Narrandera, 14 Nov. 1989, *Aston 2788* (MEL, NSW); Queanbeyan, 11 Dec. 1911, *Cambage 3349* (NSW); Joorilands, Wollondilly River, 20 Jan. 1965, *Constable 5642* (NSW); Molonglo River near Black Mountain, A.C.T., 31 Mar. 1960, *Gray 4840* (CANB); Boyd River, 15 Jan. 1977, *Jacobs 2937* (NSW); Limestone Creek, Wandsworth, 10 Jan. 1932, *McKie NSW2695* (NSW); Murie Creek, 1 km S along Wyalong road from Condoblin-Euabalong road, 28 Nov. 1983, *K.L. Wilson 5653* (NSW).

Victoria — Loch Garry, 19 km NNW of Shepparton, 17 Jan. 1987, *Aston 2611* (MEL); Wallenjoe Game Reserve, 6.5 km E of Corop, 18 Apr. 1987, *Aston 2655* (AD, BRI, MEL); 3 km NE of Wangaratta, 25 Feb. 1988, *Aston 2692* (AD, MEL); 3.5 km NNW of Piangil North, 16 Dec. 1988, *Aston 2734* (MEL); Avon River, 25 km W of St Arnaud, 19 Dec. 1988, *Aston 2746* (MEL); 3 km SSE of Wood Wood, 5 Nov. 1989, *Aston 2779* (AD, CANB, MEL).

South Australia — Neales River, Lake Eyre Basin, 28 Jan. 1978, *Knight 264* (AD); 30 km E of Macumba homestead, Lake Eyre Basin, 5 Sep. 1986, *Weber 9158* (AD).

Distribution (Fig. 4)

From the Northern Territory (one record, Gulf of Carpentaria) through eastern Queensland and New South Wales to northern Victoria, with two outlying records from the northern Lake Eyre Basin in South Australia. Most prevalent and typical in Victoria and New South Wales.

A fruiting collection (*Beauglehole 68161*, 5 Feb. 1980, MEL) from Ewing Marsh Wildlife Reserve, ± 10 km SW of Orbost, is the only definite Victorian collection of *T. multifructum* from south of the Great Dividing Range. A collection with immature fruits (*Constable 5319*, 28 Oct. 1964, NSW) from Wurruk Lagoon, Sale, is apparently this species and, if so, represents a second record from southern Victorian.

Habitat

Fresh, still to slow-flowing, usually clear water to 70 cm deep in seasonal to permanent swamps, lagoons, roadside ditches, stagnant waterholes, irrigation channels and creeks, surviving on saturated to damp soils left above receding waters. Water sometimes stained black from decomposing leaf litter of dominant trees, sometimes semi-turbid and cloudy. Rhizomes and roots embedded mostly in sandy to heavy grey clays overlain with several centimetres of soft silt, also in

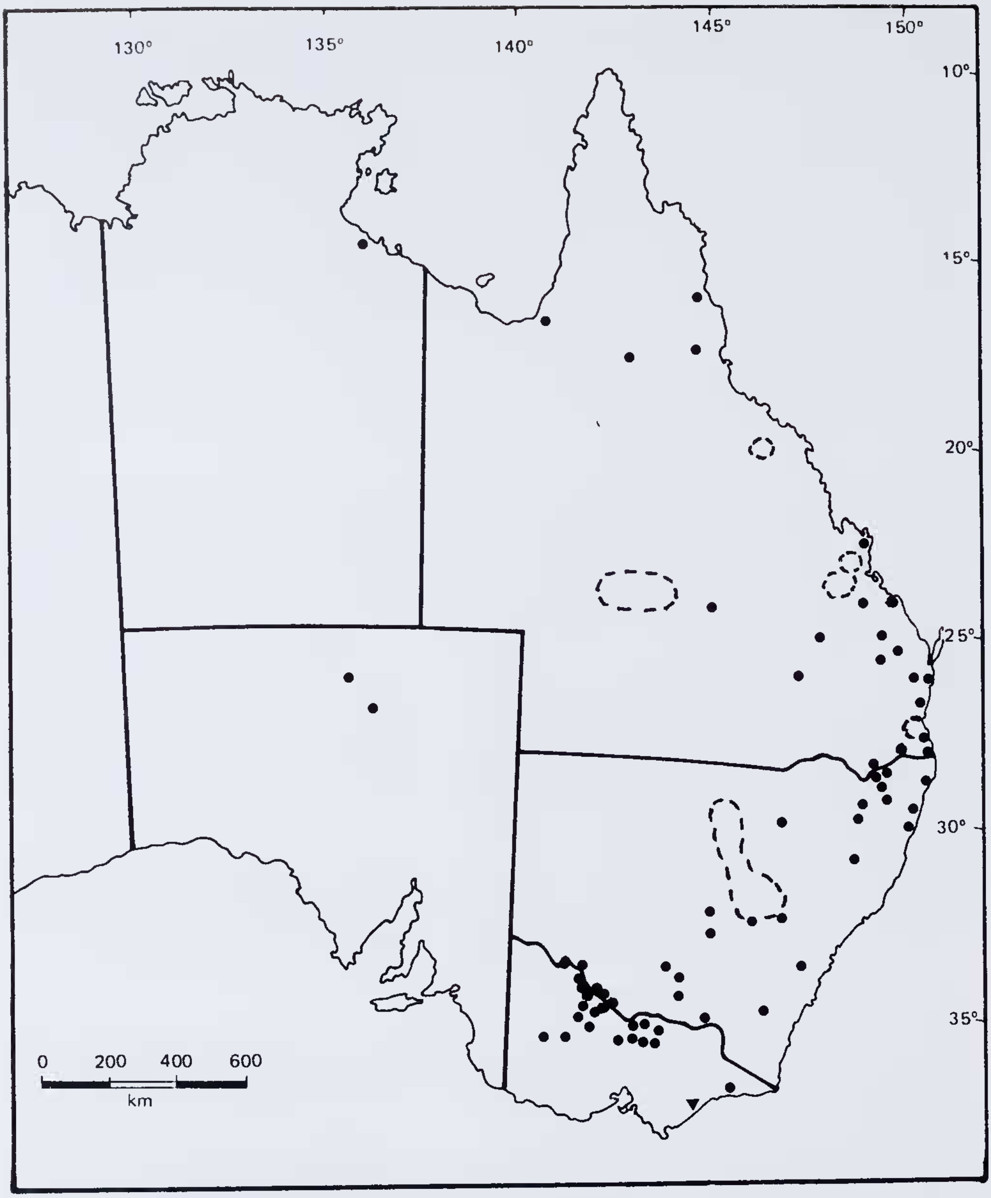

Fig. 4. Distribution map of *Triglochin multifructum*. (Triangle = a doubtful record. Dashed line = approximate position of an imprecise locality).

red-grey loamy-clay; one record (*Sharpe 1917*) in peaty soil. Sites typically in or fringed by *Eucalyptus camaldulensis* (River Red Gum) or *Melaleuca quinquinervia*; also reported in *Eucalyptus populnea* and *Eucalyptus* spp./*Casuarina littoralis* woodlands.

A lowland species usually <200 m altitude, rising to *c.* 800 m or rarely to 1050 m (Northern Tableland, N.S.W).

Flowers from August to May (Vic. and southern N.S.W.); April to September (northern tropics). Fruits from October to June (Vic. and southern N.S.W.); April to September, with one January record (northern tropics).

Notes

Variant Description: Most collections from outside Victoria and New South Wales, including the isolated records from the Lake Eyre Basin, have fruits which are more ellipsoid and often larger than those included in the main description. In some cases they may also have narrower leaves, shorter stems in fruit, and shorter infructescences with narrower rachises. All or most of these variations may be evident on the same collection (e.g. *Armit 73*, *Hoogland 8509*, *Jacobs 4849*), but this is inconsistent. Gradients occur, and I cannot discern any consistent pattern of change, either morphologically or geographically, to indicate that any of the ellipsoid-fruited plants deserve formal taxonomic recognition.

Variant measurements which extend either the upper or lower limits given in the main description are:- Leaves 2–16 mm wide; stems in fruit 28–70 cm long (including the infructescence); rachis 1.3–4.5 mm at base; infructescences 5.7–32.7 cm long; fruits 4.5–8.5 mm long × 2.8–5 mm diameter.

Diagnosis and Etymology

Mature fruiting plants of *T. multifructum* are readily distinguished in the field by the comparatively long slender infructescence with typically maroon-cyclamen rachis and small, numerous, tightly-touching fruits (*c.* 14–27 per 1 cm of rachis length). The small fruits (to 5 mm long) are globular in outline (more ellipsoid and to 8.5 mm long in the variant noted) but strongly ridged. The 6(–8) carpels are ventrally attached along most of their length and each has a prominent, narrow, longitudinal, dorsal ridge and two noticeable shoulder (lateral) ridges.

The specific epithet refers to the many fruits, up to *c.* 1000, which mature on each infructescence.

Field Observations

Triglochin multifructum frequently co-exists with *Triglochin procerum*, allowing plants of both species to be compared in identical environments subjected to the same water regimes. For example:

1. Near Wangaratta, in north-east Victoria, both (*Aston 2692*, *T. multifructum*; *Aston 2693*, *T. procerum*) were collected 100 m apart in the same lagoon. The leaves of both were indistinguishable in shape and growth-form except for the sheaths of *T. procerum* seeming a little wider towards the base. The mature leaves bent at the water surface to float upon it, the whole of the emerged portion of the leaf maintaining contact with the water. Only the tips of very young leaves rose above the surface. *T. multifructum* had the rachis tinged to deep maroon-cyclamen whereas the rachis of *T. procerum* was green.

2. At Wood Wood, in north-west Victoria, both grew intermingled over an extensive area and were collected (*Aston 2779*, *T. multifructum*; *Aston 2780*, *T. procerum*) from 1 m apart at identical heights above the receding water level. The structure of stems and leaves were similar on all plants in the mixed population but the stems were more slender and the leaves slightly narrower on plants of *T. multifructum*. The plants of *T. multifructum* also had tubers shorter and pro-

Table 1. Comparative tuber measurements of *Triglochin multifructum* and *T. procerum* from three populations.

Population	Species	Tuber length (mm)	Length = ? × diam.
Koondrook	*multifructum*	12–28	1.5–3
	procerum	33–56	4–9
Avon River	*multifructum*	22–30	3–4(-5)
	procerum	52–95	8–14
Wood Wood	*multifructum*	23–38	2–3
	procerum	37–55	3.5–7

portionally wider than those of *T. procerum* (Table 1), the rachis and pedicels cyclamen-maroon compared with green or sometimes tinged maroon in *T. procerum* and the fruits morphologically distinct and smaller and lighter yellow-green than the dark green to maroon-green fruits of *T. procerum*.

3. At Koondrook, northern Victoria, tubers (spirit collections *Aston 2783*, *T. multifructum*; *Aston 2784*, *T. procerum*) from plants growing 15 cm apart in an intermingled population were measured. Those from plants (*Aston 2746*, *T. multifructum*; *Aston 2747*, *T. procerum*) growing intermingled in a stagnant waterhole of the Avon River west of St Arnaud, Victoria, were also measured. Within each population, the tubers showed the same differences as those from Wood Wood mentioned above, tubers of *T. multifructum* being shorter and proportionally wider than those of *T. procerum* (Table 1).

4. At Piangil North, north-west Victoria, plants of *T. multifructum* (*Aston 2734*) and *T. procerum* (*Aston 2735*) were interspersed along the edge of a lagoon. *T. multifructum* was flowering and fruiting at the water's edge and in water to 30 cm deep whereas *T. procerum* occurred only above the waterline and had completed fruiting. This deeper water habitat and later flowering of *T. multifructum* in relation to *T. procerum* was not duplicated in observations at other locations.

Triglochin multifructum also grows intermingled with *Triglochin dubium* R. Br. Near Tooleybuc, S.W. New South Wales, the two were collected less than 1 metre apart. The pale to deep maroon-red rachis of *T. multifructum* (*Aston 2733*) contrasted with the green rachis of *T. dubium* (*Aston 2732*). Near Wallenjoe Swamp, central-northern Victoria, *T. multifructum* (*Aston 2806*) had broader obtuse more flattened leaf blades than *T. dubium* (*Aston 2807*) which had acute blades more or less semi-circular in cross section. The species could be distinguished vegetatively as well as by their strikingly different fruits.

Triglochin rheophilum H.I. Aston *sp. nov.*

Triglochin procerum agg., form D, Robb & Ladiges (1981).

Triglochin procerum 'D', Aston *in litt.*

Triglochin procero R. Br. foliis longis linearibus tenuibus neque incrassatis neque spongiosis versus basim, vaginis angustis, et fructibus cristis prominentibus, ellipsoidis vel obovatis leniter in circumferentia distinguitur.

Typus: Victoria — East Gippsland; Pyramid Creek, *c.* 0.05 km north on the Combienbar road from Club Terrace, 37°32.4′S, 148°56.2′E. Plants massed in narrow pools or runs up to 1 metre deep. Altitude *c.* 90 m. 14 Dec. 1991, *W.M. Molyneux s.n.* (Holotypus: MEL 705965; Isotypi: BRI, CANB, MEL 705964 & spirit material, NSW).

Rhizomes horizontal to vertical, 3.5–18.5 cm long × 4–14 mm diam., bearing long fine soft fibres 2–11 cm long. *Tubers* globular (young one), narrow-ellipsoid or narrow-oblanceolate to elliptic or obovate, or elongated and ± long-cylindrical to narrow-rhomboid and tapered at each end (often twisted or pitted by the gravelly substrate), 11–80(–102) mm long × 2–11 mm diam. (length 1.8–12.5(–20.4) times as long as diam.), terminating roots 25–126(–178) mm long; each root 1.2–7.9 times as long as its tuber. *Leaves* 41–252 cm long × (1–)2–16 mm wide, usually isolateral, non-glossy, semi-translucent and mid-green to reddish-green, completely submerged at or several centimetres below the water surface and often loosely spiralled or with undulate margins (leaves somewhat dorsiventral when stranded, with upper surfaces darker green and ± glossy), linear throughout whole length (including sheathed portion) except tapered distally, acute to narrow-obtuse, thin-textured, not thickened and spongy toward the base, sheathed over the lower (13%–)18%–42% of the leaf length. *T.S. leaf about 3 cm below the sheath summit*: linear to thinly plano-convex, width 4.4–20.7 times the thickness; each side of sheath 1.4–5.2 mm wide, equal *c.* 18%–40% of the leaf width but mostly inrolled so that sheath width when rolled is 1–3.2 mm, equal only *c.* 11%–26% of the leaf width. *Stems* in fruit (19–)29–115 cm long (including the infructescence) × 2–18 mm diameter. *Rachis* 1–10 mm diam. at base, gradually tapered upwards;

rachis and pedicels pale green-cream, rarely tinged maroon-cyclamen. *Infructescence* 5–36 cm long (= (8%–)20%–42% of the total stem length) × 15–30(–35) mm diameter. *Pedicels* often slender, upcurved, 2.5–9 mm long. *Fruits* touching, those on longer pedicels loosely so, those on shorter pedicels more firmly so, (20–)35–232 per rachis, 4–9 per 1 cm of rachis length, ellipsoid to mildly obovate in outline, 9–16 mm long × 5–9.5 mm diameter. *Carpels* 6(or 7), in fruit usually straight and erect but sometimes partly spiralled around each other and then giving a twisted appearance to the fruit, normally all maturing, 8.5–15.5 mm long × 1.6–2.8 mm wide × 2.1–4.6 mm deep; ventral edges attached along their whole length (excluding the beak sinus); attachment length = 63%–70% of carpel length; lateral faces ± flat, adpressed; dorsal ridge typically prominent and narrow-rounded, sometimes broad-rounded and less pronounced, (17%–33% of carpel depth); shoulder ridges inconspicuous before carpels separate and then seen in T.S. to be 0%–16% of carpel width (i.e., non-demarcated to projecting from the lateral faces). (Fig. 1 d & h)

Selected Specimens Examined (total examined = 65)

Queensland — Running Creek, 6 km E of Gympie, Tin Can Bay Road, 7 May 1976, *Jacobs 2522* (BRI, NSW).

New South Wales — Stoney Crossing, Red Head Road, [north of Milton], 25 Oct. 1957, *Constable s.n.* (NSW); Tianjara Falls, between Braidwood and Nerriga, 9 Nov. 1968, *Dunlop 181* (CBG); Nowra to Sassafras road, 19 Oct. 1939, *Hadley s.n.* (NSW); Crawford River [North Coast], 13 Nov. 1895, *Rudder s.n.* (MEL); Clarence River, Nov. 1875, *Wilcox s.n.* (MEL).

Victoria — Brodribb River at Sardine Creek, 14 miles direct line NNE of Orbost, 4 Dec. 1968, *Aston 1666* (CANB, MEL); Tanjil River, *c.* 100–200 m below Blue Rock Lake spillway, *c.* 11 km NNW of Moe, 23 Jan. 1992, *Aston 2842* (BRI, CANB, MEL, NSW); Tributary of Double Creek, *c.* 7 km WNW of Mallacoota, 22 Feb. 1989, *Clarke 1934* (CANB, MEL, NSW); Ferntree Creek, at crossing of the Sardine Creek road, Ellery Forest Block, East Gippsland, 20 Jan. 1987, *Earl 305* (MEL); Genoa River, on road to Wangarabell, 19.3 km NW of Princes Highway, East Gippsland, 24 Oct. 1991, *Ross 3553* & Coles (CANB, MEL, NSW).

Tasmania — Denison River at Ferny Hill Road bridge, 3 Nov. 1980, *Buchanan 300* (HO); Carlton River, 0.5 km down from Arthur Highway, 21 Oct. 1984, *Moscal 8677* (HΘ).

Distribution (Fig. 5)

Apparently most prevalent south and east of the Great Dividing Range in East Gippsland, Victoria, and in the central- and south-coast regions of New South Wales. Also recorded sparsely through north-coastal New South Wales to south-eastern Queensland (one record only), through Central Gippsland, Victoria, and in Tasmania. A 1965 collection (*P. Saenger s.n.*, MEL) from Yellingbo east of Melbourne is apparently this species and, if so, represents the most westerly record in Victoria.

Habitat

Fresh, gently to swiftly flowing, usually cold clear water to one metre deep in permanent, often rocky, streams and rivers usually subject to severe flooding and water level rises of 3 to 4 metres. Bedrock of sandstone/mudstone. Rhizomes and roots embedded usually in thick sand or gravel substrate, often secured beneath rocks. Occasionally in still residual pools of streambed. Water occasionally tannin-stained. One record each from soft mud, sandy loam, gravel over silt and small stones overlying clay. Sites typically in wet sclerophyll forest with thick shrub understoreys; streamside vegetation recorded includes *Eucalyptus* spp., *Tristaniopsis laurina*, *Tristania neriifolia*, *Acacia mearnsii*, *Callistemon subulatus*, *Calytrix tetragona*, *Hakea microcarpa*, *Carex gaudichaudiana* and *Lomandra longifolia*. Seedlings establish on saturated edge soils.

Generally extends to higher altitudes than other species, commonly occurring between 30 m and 580 m, also recorded at *c.* 970 m (*Henshall s.n.*); occasionally as low as 15 m.

Flowers from August to January. Fruits from September to February, or possibly longer as young seedlings (testas still attached) were collected in February and April.

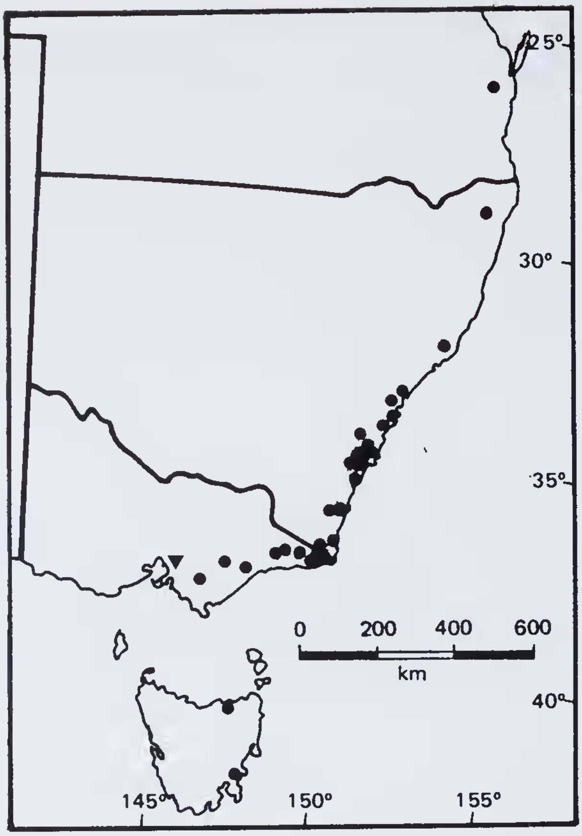

Fig. 5. Distribution map of *Triglochin rheophilum*. (Triangle = a doubtful record).

Diagnosis and Etymology

The long, narrow, linear, thin-textured, non-spongy leaves with narrow leaf sheaths and the fruits of *T. rheophilum* are distinctive. Mature fruits are 9–16 mm long, ellipsoid to mildly obovate in outline, and 4–9 per 1 cm of rachis length. The 6 (or 7) mature carpels are ventrally attached over most of their length, each with a narrow and prominent dorsal ridge. Pedicels are often longer and more slender than in other species.

Robb & Ladiges (1981; p. 645) commented on the distinctive vegetative morphology of this species (= their form D) and grew ten plants on in containers. They found the leaf characters to be apparently stable, a finding which indicates that these characters are genetically rather than environmentally controlled. My field observations (*q.v.*) support this conclusion.

The epithet *rheophilum* indicates the restriction of this species to clear, often swiftly flowing, non-polluted, flood-prone streams and rivers.

Field Observations

Vegetative plants of *T. rheophilum* (*Aston 2812*) were collected from Wonboyn Creek, New South Wales, only 1 metre from fruiting plants of an east coast variant of *T. procerum* (*Aston 2811*). They were completely submerged in 1 metre or more of strongly flowing water and showed typical thin, non-spongy leaves with narrow leaf sheaths. The plants of the *T. procerum* variant were also in flowing, although shallower, water 20–30 cm deep but showed typical erect, well-emergent leaves with thick, spongy, more or less semi-cylindrical bases and very broad, overlapping sheaths. There was no sign of any intermediacy between the two species.

Because of the submerged habit and thick foliage masses trailing downstream, infructescences of *T. rheophilum* are often hidden beneath the foliage where they, too, trail downstream.

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